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Improved production of promising antioxidant, resveratrol, in *Escherichia Coli*

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I. Introduction

Resveratrol is a promising antioxidant natural product. Studies have shown that it is effective against heart disease, cancer, Alzheimer's disease, diabetes, and harmful UV rays. This health-benefiting molecule is present in plants such as peanuts, berries, and the skin of red grapes.

A growth time of 10 months makes Japanese knotweed an impractical source of resveratrol. A more efficient way to produce resveratrol has been found by using *E. coli* as tiny biological factories.

Figure 1 – Resveratrol and *E. Coli*

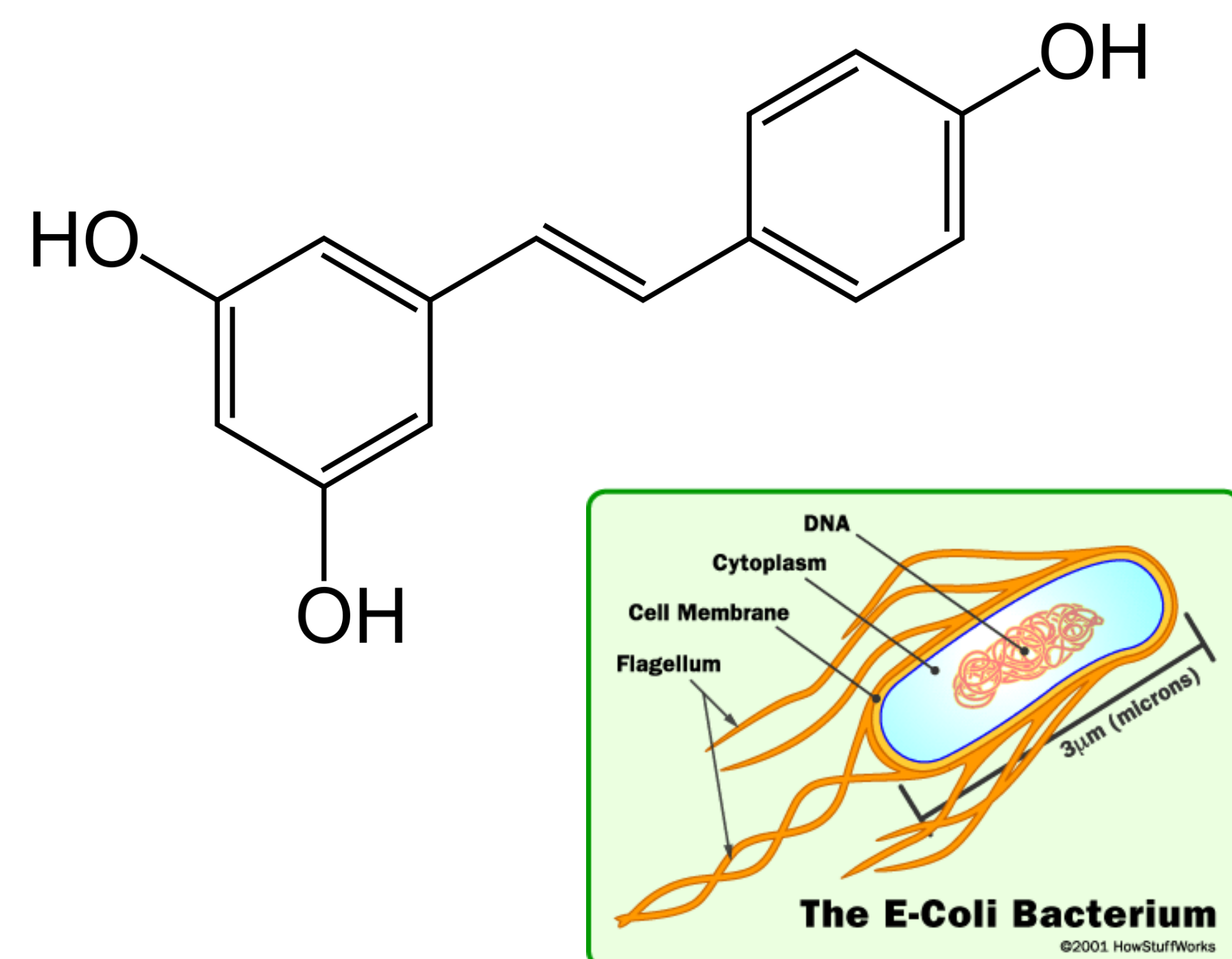
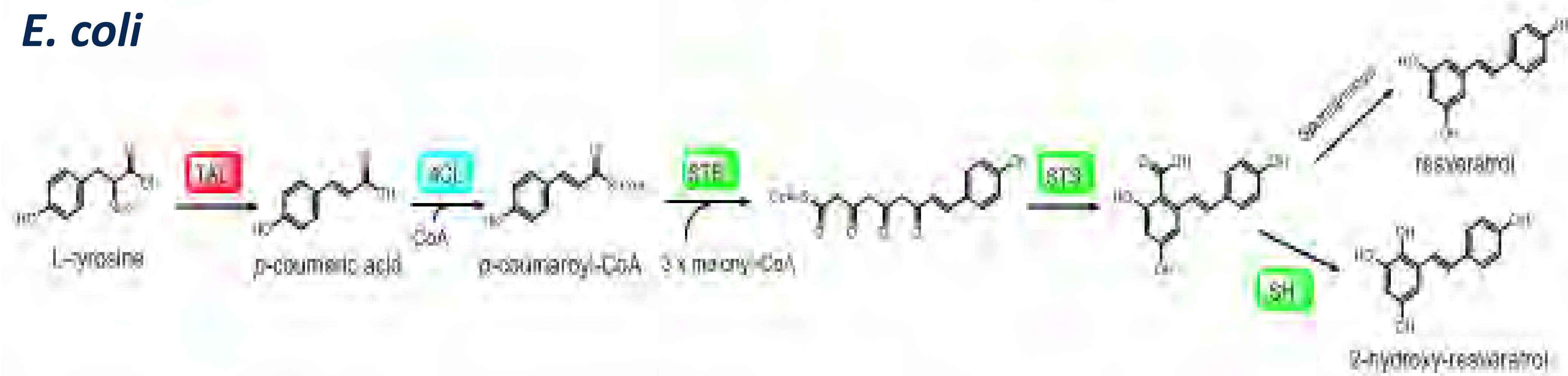


Figure 2 - Engineered biosynthetic pathway for resveratrol in *E. coli*



II. Methods

First, appropriate DNA segments must be identified and inserted into the genome of the *E. coli*. For the production of resveratrol, genes known as TAL, 4CL, and STS were selected. TAL and STS come from plants and 4CL from a bacterium. These genes are ligated onto vehicles known as vectors in order to be transported into *E. coli*. The *E. coli* is electrocuted to make the cell membrane more permeable to allow the genes to enter and incorporate into the genome of the cells. The cells are then allowed to grow for 48 hours in an antibiotic-controlled environment. Samples are then taken for analysis.

III. Results

Successful production and extraction of resveratrol is confirmed using a laboratory technique known as High Performance Liquid Chromatography (HPLC).

Analysis is also performed using Mass Spectrometry (MS).

Figure 3 shows resveratrol HPLC peaks.

Figure 3 – Genes used for synthesis and HPLC peak

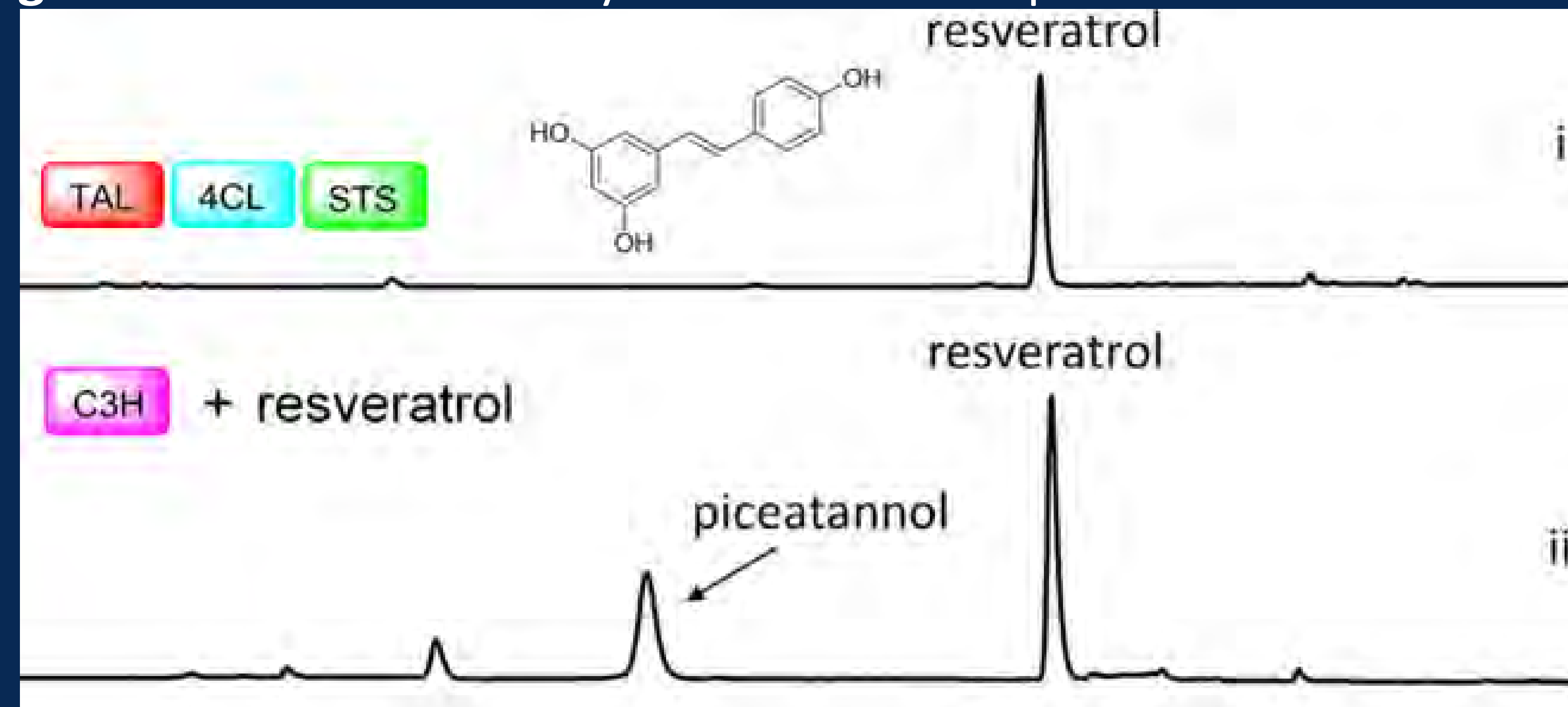


Figure 4 – Foods containing resveratrol



IV. Conclusions

Plant natural products are traditionally extracted from the producing species. However, this work has discovered a way to cheaply produce resveratrol using *E. coli* and genes borrowed from several different organisms in nature. This process takes advantage of the natural biosynthetic pathways of the *E. coli* organism, introducing a few new steps to produce the desired resveratrol product. In the future, work could be done on using *E. coli* in a similar way to produce additional medicinally-promising compounds.

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